

PVT Measurements of Dilute Organic-Water Mixtures

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The relationship of pressure and composition in the Henry's law regime has been experimentally measured in a static equilibrium cell for a set of binary organic-water mixtures. The solutes range from hydrophilic materials such as alcohols to extremely hydrophobic components such as toluene and 1,1-dichloroethane. The goal of this study is to determine the effective concentration range over which Henry's law reasonably approximates gas-liquid partitioning. The apparatus employed can determine gas-liquid partitioning coefficients through a variety of methods including: direct phase concentration ratios, Equilibrium Partitioning In Closed Systems (EPICS), ebulliometry, and application of the coexistence equation for γ^∞ . Results to date indicate a much more complex dP/dx behavior than previously assumed, and Henry's law may not apply to hydrophobic materials until the solute concentration is so near zero that analytical detection is problematic. Through this work, we are also investigating the thermodynamic basis and accuracy of approximating Henry's law constant as the ratio of a solute's pure component vapor pressure to its aqueous solubility limit. Specifically, this "rule of thumb" is being tested to determine its applicable range of solute hydrophobicity.